International Journal of Textile
and Fashion Technology (IJTFT)
ISSN(P): 2250-2378; ISSN(E): 2319-4510
Vol. 5, Issue 5, Oct 2015, 29-34

EVALUATING PERFORMANCE OF FUSIBLE INTERLININGS USED FOR LEATHER APPAREL

K. PHEBE AARON, K. KRISHNARAJ & B. CHANDRASEKARAN

Centre for Leather Apparel & Accessories Division, Central Leather Research Institute,
Chennai, Tamil Nadu, India

ABSTRACT

Interlinings are key factors in apparel accessories and play an important role in the quality of a garment. They are usually used for collars, cuffs, waistbands, pocket flaps and plackets to reinforce, to give form and shape. To the best of knowledge, there is no much research related to performance characteristics of fusible interlinings with leather. Since sheep nappa leathers are widely used for apparel applications, the present study is aimed at investigating the effect of fusible nonwoven and knitted interlinings on selected characteristics of sheep nappa leather with reference to their ability to impart a favorable appearance during wear in terms of Drapability, Flexural Rigidity, Tensile Strength, Thickness and Weight. From the results it was found that of the three interlinings studied, the fusible interlining which is knitted performed well compared to the other two nonwoven interlining materials. The results of this study will not only facilitate the basic understanding of the fusing behavior of interlining materials with nappa leathers but also be useful for apparel design and construction.

KEYWORDS: Fusible Interlinings, Drape Ability, Flexural Rigidity, Tensile Strength, Elongation

INTRODUCTION

Fusible interlinings available at present in the market provide one with a wide range of selection. The primary hand value of fusible interlinings is one of the important factors in selecting and using fusible interlinings [Fan etal. 2001]. Although there are numerous reports on the characteristics and performance of various fusible interlinings, and suppliers tend to recommend one kind of interlining or another for a particular application, selecting a fusible interlining is still largely based on trial and error method as well as past experience [Fan etal. 1997[a]].

A fused panel as a joined composite has specific properties with respect to shell and interlining. Jevsnik and Gersak emphasized the fact that it can change the properties of the shell fabric after the fusing process [Jevsniketal. 1998]. Physical property of fusible interlinings change according to the type of adhesive [Kim etal.1998]. Koenig etal observed that satisfaction with performance of fusible interlining depends heavily on favorable appearance during wear of garments [Koenig etal.1983]. Many researches have been performed on the compatibility of outer and fusible interlinings in textile materials. Sheep nappa leathers are widely used for apparel applications. To the best of our knowledge, there is no research related to performance characteristics of fusible interlinings with leather. Therefore the present study is aimed at investigating the influence of fusible interlinings on properties of sheep nappa leathers with reference to their ability to impart a favorable appearance during wear.

MATERIALS AND METHODS

Commercially available sheep nappa garment leathers with thickness 0.6±0.05 mm were procured and were designated as L1, L2, L3 and L4. They were chosen with an average size of 4±0.5 sq.ft. Three types of interlinings F1, F2 &F3 were selected and their specifications are given in Table 1.

Table 1: Specification of the Fusing Material

	F1	F2	F3
Type of Fabric	Non - Woven	Non - Woven	Knit
Weight (g/m^2)	29.2	28.39	51.44
Thickness(mm)	0.08	0.07	0.10
Fiber Content	100% Polyester	100% Polyester	100% Polyester

Four circular samples were cut from each leather. Of the four samples, three samples were fused with F1, F2 &F3 and one sample was considered as control. Fusing was carried out using a roller press machine (WIN Make – NHG 600 Shangai WEIJIE clothing machine co. Ltd.). Fusing conditions were standardized after preliminary experiments such as temperature of 120^0 C, pressure of 2 bar and time of one revolution per min.

The fused composites and the control specimens were subjected to standard testing procedure to evaluate their effects in terms of drape, flexural rigidity, tensile strength, thickness and weight. From these specimens, rectangular specimens were cut for measurement of flexural rigidity. Test specimens used for flexural rigidity measurements were further utilized for measuring thickness and weight and subjected to fabric tensile strength.

Drape Coefficient

Drape coefficient (DC) was determined using BTRA (Bombay Textile Research Association) drape tester according to Indian standard IS 8357 [BIS 1977]. The drape coefficient was expressed in percentage. A circular leather specimen of 25 cm diameter was sandwiched between two horizontal discs of smaller diameter (12.3 cm), and the unsupported annular ring of fabric was allowed to hang down under the action of gravity. A planar projection of the contour of the draped specimen was recorded on a tracing paper. The drape pattern obtained was cut along the outline and its area was determined gravimetrically. The drape coefficient was calculated (based on Cusick’s method) as a ratio of the projected area of the drape specimen to its theoretical maximum.

$$\text{Drape Coefficient (DC \%)} = \frac{\frac{w}{W} - a}{A - a} \times 100$$

Where,

W = Mass per unit area of the paper

w = Mass of the drape pattern

a = area of circle of 12.5 cm diameter

A = Area of circle of 25cm diameter

The drape coefficient was expressed as percentage. Low DC indicates good drape ability and a high value of DC indicates poor drapability.

Flexural Rigidity

Flexural rigidity was determined according to Indian standard IS 6490 test method [BIS 1971]. Considering the size of the leather, samples of dimensions 25 × 120 mm were cut. The rectangular pieces were shorter in length than the specimen length specified in the standard as it has been observed earlier that the deviation in the length of the samples up to 100 mm does not influence the flexural rigidity [Fan etal.1997[b]]. For each sample, the length of slacking part of sample (L) was measured by the constant angle method with each side up, first at one end and then at the other. The mean value of (L) was obtained from which flexural rigidity (G) was calculated.

$$G = W \times \left(\frac{L}{2}\right)^3$$

Where

W = weight per unit area of leather in mN/mm^2

G = Flexural rigidity in mNmm

Tensile Strength

It was measured according to Indian standard IS5914 [BIS 1970]. Specimens used for the above study were cut into dumb bell shape. The test was carried out using Universal testing machine, model 4501. The gauge length was 50 mm and cross head speed was 100 mm/min. The machine was allowed to run until the test piece breaks and the highest load was recorded and the force - elongation curve registered.

Weight and Thickness

Weight of the samples was measured in GSM using an electronic balance with two digit accuracy. Thickness was measured according to IS 5914 [BIS 1970].

RESULTS AND DISCUSSIONS

Drape Coefficient

Drape is defined as the extent to which a fabric will deform when it is allowed to hang under its own weight. The drape coefficient (DC) is the most fundamental parameter for quantifying drape. The drape coefficient of sheep nappa leathers for plain and fused composites was measured. Lower values indicate better drape ability and high values indicate poor drape ability. Very stiff fabric has drape coefficient close to 100% whereas a soft fabric has one close to 0%. From the Table 2, it has been observed that in most of the cases, the drape coefficient value of plain leathers is low as against fused leather composites because during fusing, the adhesive melts and spreads over the specimen making it stiff. The thickness and the weight of the fused composites are also more compared to plain leathers. Hence the drape coefficient of plain leathers is low which means better drapability. It is also noted that of the fused composites, leathers fused with warp knitted interlinings have low drape coefficient i.e. better drape ability compared to samples fused with nonwoven interlinings. The reason being in nonwoven fabrics, the individual fibresare not free to move in relation to one another and hence the fall or drape is affected whereas it is not so in the case of knitted materials.

Table 2: Drape Coefficient {%} of Plain Leather and Fused Composite Samples

Skins	Control	Fused leather composites		
		F1	F2	F3
L1	74.6	78.9	93.6	75.6
L2	62.3	95.2	75.9	73.1
L3	83.0	92.0	95.2	80.8
L4	68.2	88.9	90.7	74.4

Flexural Rigidity

Flexural rigidity is a measure of stiffness of the fabric and is related to handling in garment making [Conabere 1941]. It determines fabric's resistance to bending. The instrument used for measuring bending stiffness uses the cantilever bending principle. From the values of the bending length obtained, flexural rigidity of the fabric is calculated. Higher values mean more resistance to flexing and lower values mean easier flexing and hence better drape ability [Krishnarajetal. 2008]. Mean flexural rigidity of plain leather samples and fused composites was measured and given in Table 3. It has been observed that the flexural rigidity of plain leather samples is low compared to fused composites. The reason being, flexural rigidity is calculated based on weight and bending length. Since both weight and bending length is less for plain leathers, flexural rigidity is also less compared to fused leather composites. Of the three fused composites under study it is noted that warp knitted composites have lower flexural rigidity because they have a netted structure which can bend easily and hence manifest more flexibility and comfort.

Table 3: Flexural Rigidity {mNmm} of Leather and Fused Composite Samples

Skins	Control	Fused Leather Composites		
		F1	**F2**	**F3**
L1	16.6	37.1	35.6	21.7
L2	9.1	46.3	30.5	25.2
L3	20.1	43.1	29.1	20.3
L4	10.3	26.6	45.1	21.3

Tensile Strength

Tensile characteristic of is an important property as it relates to strength and performance of material. Tensile strength of plain leather and fused composites are given in Table 4.Results show that strength of fused composites are comparatively less than plain leathers. This is due to the arrangement of fibres in the woven/skin matrix. Among the three composites, leathers fused with warp knitted interlining show higher tensile strength. That is because the load bearing capacity is based on interlooping of yarns where as in nonwovens load bearing capacity depends on the intermeshing of fibers. It is therefore clear that interlinings made up of yarns have higher strength compared to those made from fibers.

Table 4: Tensile Strength {N/mm^2} of Leather and Fused Composite Samples

Skins	Control	Fused Leather Composites		
		F1	**F2**	**F3**
L1	16.7	14.4	10.0	15.6
L2	20.9	12.5	13.3	15.1
L3	14.9	13.1	14.7	14.7
L4	18.3	4.1	15.7	18.2

Thickness

The thickness of the circular samples was measured and averaged. It has been observed from Table 6, that thickness of the plain samples ranged between 0.54 to 0.62mm whereas for the fused composites it is on the higher side. Of the three fused composites, interlining F3which is fused with warp knitted interlining has higher thickness in most cases because its structure itself is highly voluminous. But with nonwovens fused with leathers, the thickness is less comparatively as they are pressed under high pressure using hot rollers during production. It is made clear that the thickness of the fused composites F3 is not beyond the permissible value.

Table 6: Thickness {mm} of Leather and Fused Composite Samples

Skins	Control	Fused Leather Composites		
		F1	F2	F3
L1	0.55	0.62	0.65	0.72
L2	0.62	0.73	0.72	0.86
L3	0.61	0.72	0.70	0.71
L4	0.54	0.65	0.61	0.69

Weight

Weight of the plain and fused composites is shown in Table 7.The fused composites show appreciable weight compared to plain leathers. This enhanced weight is due to the additional component fusible interlining that is attached to leathers. The weight of warp knitted composites is high because fabric is made by interlooping of yarns whereas in nonwoven fabrics, the sheet is made directly from minimum number of loose fibers.

Table 7: Weight {GSM} of Leather and Fused Composites Samples

Skins	Control	Fused Leather Composites		
		F1	F2	F3
L1	302.6	352.1	355.4	386.5
L2	351.6	401.7	320.0	408.0
L3	308.4	369.0	365.0	388.9
L4	302.1	335.8	360.0	380.0

FUNDING ACKNOWLEDGEMENTS

This work was supported by Council for Scientific & Industrial Research under XII plan project “S&T Revolution in Leather with a Green Touch” [CSC0201]

CONCLUSIONS

The research distinctly proves that the type of interlinings used for apparel play a very major role in deciding the comfort and drape of garments. For our study, three different interlinings were chosen and their influence on the compatibility with sheep nappa leathers was dealt in detail. It was observed that the warp knitted interlining performed significantly well compared to nonwovens with respect to drapability, flexural rigidity, tensile strength, thickness and weight. Therefore this study concludes that trial and error methods for selecting interlinings for apparel need not be followed anymore and the study can be taken as a basis for choosing right kind of interlinings to impart comfort, shape, flexibility, strength etc.

REFERENCES

1. Fan, J., & Ng, Y.N.(2001). Objective evaluation of the hand of nonwoven fusible interlining. Textile Research Journal, 71, 661.
2. Fan, J., Leeuwner, W., & Hunter, L.(1997[a]). Compatibility of outer and fusible interlining fabrics in tailored garments. Part III. Textile Research Journal, 67,258.
3. Jevsnik, S., & Gersak, J. (1998). Objective evaluation and prediction properties of a fused panel. International Journal of Clothing Science & Technology, 10, 252.
4. Kim, S.J., Kim, K.H., Lee, D. H., & Bae, G.H. (1998). Suitability of nonwoven fusible interlining to the thin worsted fabric. International Journal of Clothing Science & Technology, 10,273.
5. Koenig, S.K., & Kadolph, S. J.(1983).Comparison of performance characteristics of seven fusible interlinings.TextileResearchJournal,53,341.
6. IS8357. Bureau of Indian Standards. New Delhi. 1977.
7. IS6490. Bureau of Indian Standards. New Delhi. 1971.
8. Fan, J., Leeuwner, W., & Hunter, L.(1997[b]). Compatibility of outer and fusible interlining fabrics in tailored garments. Part I. Textile Research Journal, 67,137.
9. IS5914. Bureau of Indian Standards. New Delhi. 1970.
10. Conabere, G. O.(1941). Measuring the feel of leather. Journal of Leather technologists & Chemists, 25,245.
11. Krishnaraj, K., Thanikaivelan, P., & Chandrasekaran, B.(2008). Mechanical properties of sheep nappa leather influencing drape. Journal of American Leather Technologists & Chemists Association, 103,215.